Table 2. Effects of different levels of SDPP on piglet performance.

Week	0	2	4	6	8	10	CV, %	P<[a]
	SDPP, %							
	ADG, lb							
1+2	.33	.33	.52	.56	.59	.42	29	L<.04, Q<.03
3+4	1.06	1.17	1.20	1.03	1.10	1.10	11	Q<.06
1 to 4	.70	.75	.86	.79	.85	.77	12	
	ADFI, lb							
1+2	.85	.75	.98	1.06	1.08	.90	16	Q<.008
3+4	1.86	1.80	1.93	1.77	1.66	1.70	15	
1 to 4	1.35	1.40	1.55	1.47	1.44	1.34	11	
	G/F							
1+2	.83	.75	.98	1.06	1.08	.90	19	
3+4	1.27	1.43	1.37	1.29	1.52	1.46	14	
1 to 4	1.13	1.19	1.23	1.20	1.30	1.26	8	L<.04

[a] L=linear, Q=quadratic.

Effects of High Leucine Levels or Addition of alpha-ketoisocaproate on Growth and Immunoresponse in Weanling Pigs

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Introduction

High levels of leucine in diets cause immunoresponse depression in growing lambs and chickens fed normal levels of protein and in rats fed low protein levels. Conversely, addition to diets of alpha-ketoisocaproate (KIC), which is the first catabolic metabolite of leucine, caused an increased immunoresponse as well as an improvement in growth and carcass composition in growing lambs. Pigs fed KIC had higher titers against immunization with sheep red blood cells and also a decrease in lung immunofluorescence to *M. hyopneumoniae*. However, growth was not affected.

244 **Spray-dried wheat gluten and porcine plasma protein blends for nursery pigs.** L. L. Burnham, J. D. Hancock, I. H. Kim, M. R. Cabrera, K. L. Larsen*, and R. H. Hines, Kansas State University, Manhattan.

A total of 150 weanling pigs was used (average initial BW of 5.6 kg) in a 32-d growth assay to determine the optimal blend of spray-dried vital wheat gluten (WG) and spray-dried porcine plasma protein (SDPP). The SDPP was added as 8% of the control diet and the WG was substituted on a protein basis to yield the desired SDPP:WG blends. All Phase I (d 0 to 14) diets were formulated to 1.5% lysine, .42% methionine, .9% Ca, and .8% P. Treatments were: 1) SDPP; 2) 75% SDPP and 25% WG; 3) 50% SDPP and 50% WG; 4) 25% SDPP and 75% WG; and 5) WG. The same corn-soybean meal-whey-based diet (with 1.5% blood meal and 1.2% lysine) was fed to all pigs during Phase II (d 14 to 32) of the experiment. For d 0 to 14, ADG and ADFI increased with up to 50% replacement of the SDPP and decreased when more of the SDPP was removed from the diet (quadratic effects, $P < .004$ and .02, respectively). Apparent digestibilities of DM and N (at d 13) were not affected by treatment ($P > .18$). For d 14 to 32, treatment did not affect ADG ($P > .2$), although there were quadratic responses in ADFI (with the greatest ADFI for pigs fed the 50:50 blend, $P < .04$) and G/F (with the lowest G/F for pigs fed the 25:75 blend, $P < .03$). Overall (d 0 to 32), ADG and ADFI increased as WG was used to replace 50% of the SDPP (quadratic effects, $P < .04$ and .02, respectively). In conclusion, the optimum ratio of WG and SDPP for maximum rate of gain and feed intake in nursery pigs was the 50:50 blend. However, maximum efficiency of gain was still achieved with the greatest (8%) inclusion of SDPP.

Item	100% SDPP	75% SDPP+ 25% WG	50% SDPP+ 50% WG	25% SDPP+ 75% WG	100% WG	CV
d 0 to 14						
ADG, g	412	427	426	393	357	6.5
ADFI, g	433	457	458	435	393	8.5
G/F	.952	.935	.935	.903	.916	4.1
d 14 to 32						
ADG, g	548	570	578	547	548	7.0
ADFI, g	805	845	880	842	805	7.6
G/F	.682	.676	.658	.650	.684	3.5
D 0 to 32						
ADG, g	488	507	512	479	464	6.0
ADFI, g	642	675	695	664	625	7.3
G/F	.761	.753	.737	.723	.748	2.9
Digestibilities (d 13), %						
DM	88.4	90.5	89.5	89.6	89.5	2.7
N	84.0	87.6	86.8	86.8	87.6	4.0

Key Words: Pig, Wheat Gluten, Plasma Protein

245 **Assessment of spray-dried immunoglobulin G from porcine plasma on performance of early-weaned pigs.** J.L. Pierce*, G.L. Cromwell and M.D. Lindemann, University of Kentucky, Lexington.

An experiment involving 90 pigs was conducted to assess the inclusion of spray-dried porcine plasma (SDPP) and the immunoglobulin G (IgG) fraction of SDPP in diets for early-weaned pigs. The SDPP (AP 920™) contained 17.9% IgG and the IgG fraction contained 65.3% IgG (both were provided by American Protein Corp., Ames, IA). Pigs were weaned at 14±2 d (5.3 kg initial BW) and moved to an off-site, environmentally-controlled nursery with elevated, woven wire-floored pens (1.5 m^2/pen). There were four replicates of four or five pigs/pen. A basal diet (Diet 1) consisted of corn, dehulled soybean meal, soy protein concentrate (SPC, Profine E™, Central Soya, Decatur, IN), dried whey, corn oil, minerals, vitamins, antibiotics and $CuSO_4$. The IgG fraction was included in Diets 2, 3, and 4 to approximate 64%, 128% or 192%, respectively, of the IgG in SDPP. In Diet 5, SDPP was added at 8% and was substituted for SPC. Lysine, methionine, Na, and ME were maintained at 1.50%, .45%, .49%, and 3.24 Mcal ME/kg in all diets. Daily gain, daily feed intake, and feed:gain ratios for pigs fed the five diets were, respectively: (wk 0-1) 117, 146, 180, 168, 102 g/d; 178, 196, 225, 204, 187 g/d; 1.57, 1.46, 1.29, 1.24, 1.99; (wk 0-2) 170, 228, 264, 258, 228 g/d; 243, 326, 373, 356, 356 g/d; 1.44, 1.45, 1.42, 1.39, 1.58; (wk 0-4) 327, 364, 395, 341, 335 g/d; 474, 527, 554, 524, 515 g/d; 1.45, 1.45, 1.40, 1.55, 1.53. Growth rate and feed intake increased linearly ($P<.05$) with increasing levels of IgG in the diet during wk 1, and the response to IgG continued through wk 2 (quadratic, $P<.05$). Increased growth rate with increasing dietary IgG level continued through wk 4 (quadratic, $P<.01$). Inclusion of SDPP improved growth rate and feed intake at wk 2 ($P<.01$) but not at wk 1 or wk 4. The beneficial effects from the IgG fraction appear to be maximized near the level of IgG found in SDPP.

Key Words: Pig, Plasma Protein, Immunoglobulin

246 **Lactose response is dependent on plasma in the diet of weaned pigs.** K.J. Touchette*, S.D. Crow, G.L. Allee, and M.D. Newcomb. University of Missouri, Columbia.

An experiment was conducted using 144 pigs initially weighing 6.42 kg to evaluate the response of the pig to lactose and animal plasma (AP920) in the diet. The experiment was designed as a randomized complete block of 48 pens with a 2x4 factorial arrangement of two levels of plasma (0 and 6.75%) and four levels of lactose (0, 15, 30, and 45%). Diets contained corn, extruded soy protein concentrate, 5% soybean meal (48%), 2% lard, 1.75% blood meal (AP300), and vitamins and minerals to exceed requirements (NRC, 1988). Diets were formulated to provide 1.56% lysine and 0.86% sulfur amino acids. ADG increased linearly with increasing lactose levels in the first week and showed a quadratic effect in the second week and for the entire study ($P<.05$). ADFI showed a quadratic effect in the second week and increased linearly for the entire study ($P<.05$). Feed efficiency (G/F) improved linearly in the first week and quadratically for the entire study ($P<.05$). Plasma addition resulted in increased ADG (242 vs. 175 g, $P<.05$) and ADFI (338 vs. 249 g $P<.05$) in the first week. There were no significant differences in growth or feed intake in the second week. For the entire study ADG and ADFI were higher ($P<.05$) in pigs fed plasma. G/F was not affected by added plasma. There were interactions between plasma and lactose in the first week for G/F ($P=.055$) and ADG and ADFI ($P=.08$). Pigs receiving plasma reached their peak performance between 0% and 15% added lactose while pigs not fed plasma reached their peak performance between 30% and 45% added lactose. These results suggest that plasma added to the diet of the weaned pig improves performance by increasing voluntary feed intake. It also shows that the lactose response is dependent on plasma in the diet.

Lactose level (%)	0	15	30	45	SEM
ADG, g[a]	233	287	311	303	0.011
ADFI, g[c]	361	408	406	410	0.011
G/F[a]	0.64	0.70	0.77	0.74	0.014

[a] Quadratic effect of lactose ($P<.05$)
[c] Linear effect of lactose ($P<.05$)

Key Words: Weaning Pigs, Lactose, Plasma

247 **The effects of substituting spray-dried whole egg from grading plants only for spray-dried animal plasma in phase I diets.** W. B. Nessmith Jr.*, M. D. Tokach, R. D. Goodband, J. L. Nelssen, J. R. Bergstrom, J. W. Smith II., K. Q. Owen, and B. T Richert. Kansas State University, Manhattan

Two hundred seventy weanling pigs (initially 4.29 kg and 14 d of age) were used in a 28 d growth trial to identify the effects of replacing spray-dried animal plasma with spray-dried whole egg as a protein source in starter diets. Pigs were blocked by weight with six replications per treatment and seven to ten pigs per pen. The control diet contained 7% spray-dried animal plasma, 1.75% spray-dried blood meal, and 20% dried whey. Whole egg was substituted for animal plasma on an equal lysine basis to form the experimental diets. The whole egg protein used contained no hatchery waste and included eggs from grading plants only. The whole egg contained 3.55% lysine, 49% CP, 40.1% fat, and 5.2% ash. All diets contained 5% soybean oil and were formulated to 1.5% lysine. Dietary treatments, fed from d 0 to 14, were based on the amount of whole egg replacing spray-dried animal plasma. Treatments were as follows: 1) 0% whole egg : 7% animal plasma, 2) 3% whole egg : 5.25% animal plasma, 3) 6% whole egg : 3.5% animal plasma, 4) 9% whole egg : 1.75% animal plasma, and 5) 12% whole egg : 0% animal plasma. In phase II (d 14 to 28), a common corn-soybean meal diet containing 2.5% spray-dried blood meal and 10% dried whey was fed in a meal form. This common diet was formulated to 1.35% lysine, .9% Ca, and .8% P. From d 0 to 14, ADG and feed efficiency (G/F) were linearly ($P < .005$ and $P < .007$, respectively) reduced with increasing whole egg in the diet. However, the negative influence was most apparent in the diets containing 9 and 12% whole egg. Pigs fed diets with 0, 3, and 6 % egg were similar in performance from d 0 to 14. In phase II (d 14 to 28), ADG was similar for all treatments. However, increasing levels of whole egg in the phase I diet decreased ADFI in phase II, linearly improving ($P < .007$) G/F. For the overall trial, there were no differences due to dietary treatments. These data suggest that replacing greater than 50% spray-dried animal plasma with spray-dried whole egg decreases performance in phase I.

	% Whole Egg					Probability		
Item	0	3	6	9	12	Linear	Quadratic	CV
D 0 to 14								
ADG, g	209	203	209	187	192	.005	.72	6.1
G/F	.84	.84	.81	.77	.77	.007	.89	6.5
D 14 to 28								
ADG, g	394	383	406	398	404	.32	.96	6.8
G/F	.58	.62	.62	.62	.64	.006	.32	4.7
D 0 to 28								
ADG, g	301	292	307	293	298	.76	.96	5.3
G/F	.65	.68	.67	.66	.67	.42	.34	4.1

Key Words: Weanling pig, Plasma, Growth performance, Egg

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